ultrasonography (CEU) targeting VCAM-1 might allow the molecular imaging of VCAM-1 expression in a rabbit model of atherosclerosis.
Methods: Atherosclerotic lesions were induced by highcholesterol diet in 20 male New Zealand white rabbits. CEU molecular imaging for aortic endothelial VCAM-1 expression was performed with VCAM-1-targeted (MBVCAM) and control microbubbles (MBCtr). Histology, immunohistology and real time qPCR were used to assess plaque burden and VCAM-1 mRNA expression.
Results: In the atherosclerosis group, the peak signal intensity of targeted microbubbles increased compared with the control group (29.99±2.55 vs 0.05±24.61±2.25, $P<0.01$). Retention of VCAM-1 targeted microbubbles was significantly higher than retention of nontargeted microbubbles1 (21.56±1.12 vs 15.24±1.02, $P<0.01$). VCAM-1 mRNA expression in atherosclerosis group was 60-fold higher than in control group (3.08±0.61 vs 0.05±0.02, $P<0.001$). In addition, the PSI of abdominal wall enhancement detected with ultrasound after injection of VCAM-1 targeted contrast agent highly correlated with indeed VCAM-1 mRNA expression measured in corresponding abdominal segments using real time qPCR ($r=0.865$, $P<0.001$).
Conclusions: VCAM-1 targeted CEU can detection and quantification of VCAM-1 expression in an experimental atherosclerotic model. This easily accessible, low-cost technique may be useful in assessing treatment effects in preclinical research and in patients.

GW25-e3542

The Experimental study of noninvasive evaluation of vascular phantom Elasticity with ultrasound radiofrequency-data technique

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Objectives: As a novel, noninvasive vessel wall tracking technique, ultrasound radiofrequency (RF)-data technique has been used preliminary for evaluating artery wall elasticity in clinic, which has potential for detecting early stage atherosclerosis. This objective was to investigate the feasibility and accuracy of ultrasound RF-data technique for detecting the vessel wall elasticity by vascular phantom experiment.
Methods: Five standard-unified vascular phantoms were manufactured, and the mechanical stiffness of phantom wall was designed as 35HA, 40HA, 45HA, 50HA and 55HA, respectively. A closed-ring compression system was built, which was similar to human circulatory system. And then the phantom wall elastic parameters including compliance coefficient (CC), distensibility coefficient (DC), α stiffness (α), β stiffness (β) and single point pulse wave velocity (PWV) were calculated automatically by ultrasound RF-data technique. Every vascular phantom was measured three times repeatedly, and the mean value was used for further analysis.
Results: Mechanical stiffness of vascular phantoms correlated with DC ($r=-0.962$, $P<0.01$), α ($r=0.984$, $P<0.01$), β ($r=0.985$, $P<0.01$), PWV ($r=0.978$, $P<0.01$) and CC ($r=-0.805$, $P>0.01$). With the mechanical stiffness of vascular phantoms increase, the mean value of elastic parameters measured by ultrasound RF-data technique were (1) 0.030±0.010 kPa^{-1}, 0.027±0.006 kPa^{-1}, 0.017±0.006 kPa^{-1}, 0.010±0.000 kPa^{-1} and 0.010±0.000 kPa^{-1} for DC, (2) 0.923±0.220 mm^2/kPa, 0.593±0.105 mm^2/kPa, 0.437±0.106 mm^2/kPa, 0.540±0.079 mm^2/kPa and 0.443±0.116 mm^2/kPa for CC, (3) 3.156±1.118, 3.627±0.641, 5.743±1.004, 6.830±0.135 and 7.797±0.263 for α, (4) 6.467±2.209, 7.440±1.274, 11.663±1.995, 13.873±0.337 and 15.760±0.521 for β, (5) 5.663±0.951m/s, 6.217±0.508m/s, 7.793±0.695m/s, 8.683±0.460m/s and 9.030±0.234 m/s for PWV.
Conclusions: Ultrasound RF-data technique can distinguish the variation tendency of vascular phantoms with different mechanical stiffness. It is feasible for evaluating artery wall elasticity in clinic, and it is hopeful to reflect early atherosclerosis.

GW25-e4205

Prognostic significance of myocardial fibrosis quantification by noninvasive imaging techniques in patients with cardiovascular disease

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Objectives: This study was to evaluate the prognostic significance of noninvasive imaging techniques for the prediction of myocardial fibrosis (MF) in patients with cardiovascular disease.
Methods: The clinical literatures related with the noninvasive detection of MF were taken as the object of study with the application of basic research method of literature review.
Results: Recent reports demonstrated the evaluation of MF focus on secure and noninvasive imaging techniques have further pushed our ability to accurately and precisely analyze myocardial tissue composition, especially MF content. In this paper we present as follows: (1) cardiovascular magnetic resonance (CMR): CMR has emerged as a noninvasive imaging technique that may uniquely characterize the extent of replacement fibrosis and have prognostic value in various cardiomyopathies. T1 mapping and extracellular volume mapping (ECV) combined with CMR are methods that have the potential to assess interstitial MF. The use of CMR with late post-gadolinium myocardial enhancement (LGE) is an emerging technique that could improve CMR's diagnostic accuracy, especially for interstitial diffuse myocardial fibrosis and present as an important risk-stratifying investigation in dilated cardiomyopathy (DCM) patients. Although LGE-CMR is the most accurate method to measure MF that could be integrated in the monitoring and therapeutic management of a large number of patients, while its sensitivity is limited for the assessment of diffuse interstitial fibrosis. (2) Computed Tomography (CT): By using a relatively low-radiation-dose method, ECV values for cardiac CT were shown good reproducibility, representing a potential new approach toward the clinical assessment of diffuse myocardial fibrosis. While cardiac CT were not available at the time of protocol development. Another reports showed that 3D ECV fraction by low-radiation dose cardiac CT may be a potential and useful noninvasive marker of fibrosis suggesting the novel assessment for myocardial tissue characterization. (3) Nuclear imaging techniques: Nuclear imaging techniques [i.e. single photon emission computed tomography (SPECT) and positron emission tomography (PET)] have been the main molecular imaging modalities based on the use of molecular probes in very low concentrations within a living organism of MF at the molecular and cellular level and also seen as a potentially attractive clinical tool to provide early diagnosis and individual risk assessment of MF. Another imaging modalities for Molecular imaging could be MRI, CT, Ultrasound, Optical imaging. (4) Ultrasound: Ultrasonic myocardial tissue characterization by integrated backscatter (IBS) has been used for the differentiation between various myopathies and normal myocardium. 2DS is a new echocardiographic technology that is based on grey scale B-mode images, and allows angle-independent assessment of myocardial function. It provides images at real time and facilitates evaluation of different components of complex cardiac motions which can be readily used in clinical practice. Both of 2DS and IBS were used to evaluate LV reverse remodelling in patients with non-ischaemic dilated cardiomyopathy (DCM).
Conclusions: This review summarizes the advantages and limitations of noninvasive imaging techniques for the assessment of myocardial fibrosis. We still need to establish a comprehensive evaluation method which can provide important insight into accurate-early diagnosis and elaborate mechanisms of MF.

GW25-e4258

Altered left ventricular torsion and function during normal pregnancy

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Objectives: Left ventricular torsion and subsequent untwisting, the helical twisting and untwisting motion of the LV about its longitudinal long axis, play an important role in myocardial contractility and structure. Alterations in left ventricular twist and untwist have been described for a variety of physiologic and pathologic conditions. During pregnancy, the cardiovascular system adapts to the metabolic needs of mother and fetus. The effects of this adaptation on left ventricular torsion and untwist have not been well documented. The aim of this study was to evaluate the LV torsional mechanics during normal pregnancy.
Methods: 2D speckle tracing imaging were performed in 80 woman, aged (mean±SD) 32.4±4.6 years at gestational weeks 14-16, 16-24, 36, and 6 months postpartum. LV torsion was defined as apical rotation relative t o the base.LV rotation, Left ventricular rotations were obtained at basal and apical short-axis levels, untwisting rate and untwisting rate in IVRT were also measured.
Results: (1) Cardiac output and LV end-diastolic volume were on average 20% and 23%higher, respectively, during pregnancy; (2) Analysis of LV torsional behavior revealed that compared to that 6 months postpartum (12.69±2.9), there was a significant increase in peak LV twist from14-16weeks (12.38±2.7); 16-24 weeks (13.21±3.2) to 36 weeks (15.67±3.9) (all $P<0.05$). (3) Changes of LV untwist behavior revealed there was a significant increase in LV untwisting rate during pregnancy (118.34±28.89°/sec, 109.76±23.53°/sec, 154.43±48.28°/sec) compared to that 6 months postpartum (112.73±27.94°/sec), but untwisting rate in IVRT was decreased during pregnancy compared to that 6 months postpartum ($P<0.05$) (all $P<0.05$). (4) Multiple linear regression analysis showed that: the change in LV end-systolic volume was independently associated with the change in twist (β=-0.19, SE=0.08, P=0.02); the change in stroke volume was the only independent factor associated with the change in untwisting rate (β=-0.37, SE=0.65, P=0.047).
Conclusions: There are significant changes in LV torsional indices during normal pregnancy, whereas LV twist and peak untwisting rate increase and correlate with end-systolic and stroke volume, respectively.

GW25-e5344

Improvement of left ventricular myocardial perfusion after acidic fibroblast growth factor delivered by using ultrasound-targeted microbubble destruction in diabetic cardiomyopathy in rats: an preliminary study

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Objectives: To investigate the protective effects of left ventricular myocardial perfusion after delivery of acidic fibroblast growth factor (aFGF) in diabetic cardiomyopathy (DCM) in rats by using ultrasound-targeted microbubble destruction (UTMD) with real-time myocardial contrast echocardiography (RT-MCE).
Methods: Among 52 male SD rats, forty rats were randomly selected and were induced to be DCM models by streptozotocin through intraperitoneal injecting. The other rats as normal control group. DCM rats were randomly divided into the DCM model group, aFGF only group and the SonoVue-aFGF+UTMD group in this study. The aFGF only group rats were injected with aFGF solution through tail vein and the SonoVue-aFGF+UTMD group rats were injected with